

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (canceled).

- 1 2. (previously presented) The method of Claim 23 wherein said first
2 index is a bitmap.
3
- 1 3. (previously presented) The method of Claim 23 wherein each of the
2 plurality of sub-areas is rectangular.
3
- 1 4. (previously presented) The method of Claim 23 wherein said first
2 index is stored internally of the parcel associated therewith.
3
- 1 5. (previously presented) The method of Claim 23 further comprising:
2 with respect to each of said parcels, storing a second index identifying boundaries
3 of each of said plurality of sub-areas.
4
- 1 6. (original) The method of Claim 5 wherein said second index is a
2 kd-tree index.
3
- 1 7. (original) The method of Claim 5 wherein said second index is stored
2 internally of said parcel.
3
- 1 8. (previously presented) The method of Claim 23 wherein with
2 respect to each parcel, the data entities that represent geographic features encompassed
3 by each of said plurality of sub-areas are approximately equal in number to the data
4 entities that represent geographic features encompassed by each of the other of the
5 plurality of sub-areas.
6

7

1 9. (previously presented) The method of Claim 23 wherein the data
2 entities represent segments of roads in the geographic region.

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1 10. (previously presented) The method of Claim 23 wherein the step of
2 dividing forms eight sub-areas.

3

Claims 11 and 12 (canceled).

1 13. (previously presented) The method of Claim 25 wherein said data
2 entities represent segments of roads.

3

1 14. (previously presented) The method of Claim 25 wherein the first
2 index is a kd-tree index.

3

1 15. (previously presented) The method of Claim 25 wherein the second
2 index is a bitmap.

3

Claim 16 (canceled).

1 17. (previously presented) The invention of Claim 26 further
2 comprising:

3 a plurality of index tables of a second type, each of which is associated with a
4 separate respective one of said plurality of parcels, wherein each of said index tables of
5 the second type comprises:

6 a reference to each of a plurality of separate sub-areas into which the area
7 associated with the respective parcel is divided.

8

Claim 18 (canceled).

1 19. (currently amended) The invention of Claim [[27]] 26 wherein
2 the sub-areas associated with each parcel are spatially organized.
3

1 20. (currently amended) The invention of Claim [[27]] 29 wherein
2 the data [[entities]] records associated with each [[rectangular]] sub-area are
3 approximately similar in number to each other.
4

Claims 21 and 22 (canceled).

1 23. (previously presented) A computer-implemented method for
2 producing a database that represents geographic features in a geographic region
3 comprising the steps of:

4 separating a plurality of data entities that represent the geographic features into a
5 plurality of parcels,

6 wherein each parcel of said plurality of parcels contains a separate
7 subset of said plurality of data entities, and

8 wherein the subset of said plurality of data entities contained in
9 each parcel represents the geographic features located in a separate one of
10 a plurality of areas into which the geographic region is divided;

11 wherein an improvement comprises:

12 for each parcel of said plurality of parcels,

13 dividing the area associated therewith into a plurality of sub-areas;

14 and

15 storing a first index that identifies, for each of the data entities
16 contained in the parcel, each of the sub-areas intersected by the geographic
17 feature represented thereby,

18 whereby each sub-area in which a geographic feature is located can be determined
19 by using the first index.
20

21

1 24. (currently amended) A computer-implemented method of using a
2 geographic database comprising the steps of:

3 accepting specification of a search area in a geographic region represented by the
4 geographic database;

5 identifying a parcel of data in the geographic database, wherein the parcel
6 contains data entities that represent geographic features encompassed within a first
7 rectangular area located within the geographic region, wherein the first rectangular area
8 intersects said search area;

9 wherein an improvement comprises:

10 using a first index associated with the parcel to identify which of a plurality of
11 rectangular sub-areas into which the first rectangular area is divided intersect the search
12 area; and

13 using a second index associated with the parcel to identify the data entities
14 contained in the parcel that represent geographic features that intersect each of the
15 plurality of rectangular sub-areas identified as intersecting the search area,

16 such that in the case that the search area intersects more than one of said plurality
17 of rectangular sub-areas and a geographic feature represented by a single data entity
18 intersects each of said more than one of said plurality of rectangular sub-areas, the second
19 index identifies said single data entity,

20 whereby the data entities that represent the geographic features located within the
21 search area are determined.

22

1 25. (currently amended) A computer-implemented method of using a
2 geographic database to identify geographic features located within a search area, wherein
3 the geographic database contains data entities that represent geographic features located
4 in a geographic region, and wherein the geographic database is organized into parcels,
5 each of which contains a subset of all the data entities in the geographic database, and
6 wherein the subset of data entities in each parcel represent the geographic features

7 encompassed within a separate respective one of a plurality of rectangular areas into
8 which the geographic region is divided, wherein the method comprises the steps of:

9 (a) identifying each parcel that is associated with a rectangular area that
10 intersects the search area;

11 wherein an improvement comprises:

12 (b) for each parcel identified in step (a), using a first index associated with the
13 parcel to identify each rectangular sub-area formed of the rectangular area associated
14 with the parcel that intersects the search area; and

15 (c) for each parcel identified in step (a), using a second index associated with
16 the parcel to identify each of the data entities contained therein that represents a
17 geographic feature that intersects each of the sub-areas identified in step (b),

18 such that in the case that the search area intersects more than one of said plurality
19 of rectangular sub-areas and a geographic feature represented by a single data entity
20 intersects each of said more than one of said plurality of rectangular sub-areas, the second
21 index identifies said single data entity,

22 whereby the data entities identified in step (c) represent geographic features
23 located in the search area.

24
1 26. (previously presented) In a geographic database comprised of data
2 records and stored on a computer-readable medium, wherein each data record represents
3 a physical geographic feature in a geographic region,

4 wherein the data records are separated into a plurality of parcels,

5 wherein each parcel contains a separate portion of the data records, such that the
6 portion of data records contained in each parcel represents those geographic features
7 encompassed together in a separate respective one of a plurality of areas formed by
8 dividing the geographic region,

9 wherein the improvement comprises:

10 a plurality of index tables of a first type, each of which is associated with a
11 separate one of said plurality of parcels and wherein each of said index tables of the first
12 type comprises:

13 a separate reference to each data record in the parcel to which said index
14 table is associated; and
15 a reference to at least one of a plurality of groupings of the plurality of
16 data records in the parcel,
17 wherein the plurality of groupings are based upon a division of the area associated
18 with the parcel into a plurality of smaller sub-areas.

19

Claim 27 (canceled).

1 28. (currently amended) The invention of Claim [[27]] 26 wherein
2 said data [[entities]] records represent segments of roads.

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1 29. (currently amended) A computer usable medium having
2 computer readable data structure means embodied thereon, wherein the computer
3 readable data structure means is used for a database for geographic data comprised of
4 data records that represent segments of roads located in a geographic region, said
5 computer readable data structure comprising:

6 a plurality of parcels, each of which contains a separate portion of the data
7 records, such that each parcel contains the data records that represent the segments of
8 roads located in a separate one of a plurality of areas into which the geographic region is
9 divided;

10 wherein an improvement comprises:

11 a plurality of first indexes, each of which is associated with a respective one of the
12 plurality of parcels, wherein each first index defines a plurality of sub-areas formed of the
13 area associated with the parcel associated therewith; and

14 a plurality of second indexes, each of which is associated with a respective one of
15 the plurality of parcels, wherein each second index associates each of the data records in
16 the parcel associated therewith to at least one of the plurality of sub-areas defined by the
17 first index associated with the parcel,

18 wherein in the case where a geographic feature represented by a single data entity
19 intersects more than one of said plurality of rectangular sub-areas, the second index
20 identifies said single data entity,

21 whereby the computer readable data structure means identifies which of the data
22 records represent segments of roads located in any specified sub-area of any specified
23 area.